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SEQUENCE LISTING

<110> INTERNATIONAL LIVESTOCK RESEARCH INSTITUTE

<120> EAST COAST FEVER VACCINE BASED ON CTL-SPECIFIC
SCHIZONT ANTIGENS

<130> 41860-205200

<140>

<141>

<150> 60/486,750

<151> 2003-07-14

<160> 77

<170> PatentIn Ver. 3.2

<210> 1

<211> 543

<212> PRT

<213> Theileria parva

<400> 1

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20 25 30Glu Lys Glu Glu Glu Leu Lys Pro Pro Ser Ala Leu Glu Asp Glu Leu
35 40 45Lys Lys Arg Glu Glu Glu Ser Arg Lys Arg Met Glu Glu Met Gln Lys
50 55 60Glu Ile Leu Glu Lys Lys Leu Arg Glu Gly Lys Lys Ala Leu Glu Glu
65 70 75 80Leu Glu Lys Arg Glu Lys Glu Val Val Asp Glu Phe Ala Lys His Leu
85 90 95Lys Lys Pro Glu Glu Arg Leu Pro Lys Ile Ile Leu Thr Leu Asp Ser
100 105 110Gly Phe Pro Thr Val Asp Pro Ile Thr Tyr Thr Ser Gly Val Tyr Met
115 120 125Val Ala Val Ser Lys Thr Thr Phe Thr Ser Asp Ser Asp Leu Val Asp
130 135 140Phe Thr His Thr Leu Leu Gly Ile Lys Phe Leu Val Thr Gly Val Gln
145 150 155 160Phe Gly Gly Lys Thr Tyr Thr Ile Lys Pro Ile Glu Ala Thr Met Ala
165 170 175

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Thr	Ser	Ile	Ala	Phe	Ala	Ala	Asp	Pro	Gly	Phe	Cys	Tyr	Phe	Leu	Leu	
			180					185					190			
Ile	Pro	Gly	Pro	Asp	Ser	Lys	Pro	Ile	Phe	Phe	Lys	Asn	Asp	Gly	Asp	
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Lys	Phe	Leu	Arg	Cys	Val	Gly	Tyr	Pro	Lys	Val	Lys	Glu	Glu	Met	Leu	
	210					215					220					
Glu	Met	Ala	Thr	Lys	Phe	Asn	Arg	Leu	Pro	Lys	Gly	Val	Glu	Ile	Pro	
225					230					235					240	
Ala	Pro	Pro	Gly	Val	Lys	Pro	Glu	Ala	Pro	Thr	Pro	Thr	Pro	Thr	Thr	
				245					250						255	
Ile	Thr	Pro	Ser	Val	Pro	Pro	Thr	Ile	Pro	Thr	Pro	Ile	Thr	Pro	Ser	
			260					265					270			
Ala	Pro	Pro	Thr	Thr	Pro	Pro	Thr	Gly	Leu	Asn	Phe	Asn	Leu	Thr	Val	
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Gln	Asn	Lys	Phe	Met	Ile	Gly	Ser	Gln	Glu	Val	Lys	Leu	Asn	Ile	Thr	
	290					295					300					
His	Glu	Tyr	Glu	Gly	Val	Tyr	Glu	Ala	His	Lys	Tyr	Phe	Ile	Glu	Arg	
305					310					315					320	
Gly	Ser	Phe	Thr	Pro	Thr	Ser	Phe	Ser	Ile	Gly	Asp	Leu	Pro	Gln	Thr	
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Gly	Leu	Pro	Val	Asn	Gln	Thr	Val	Asp	Thr	Ile	Val	Val	Tyr	Phe	His	
			340					345					350			
Arg	Val	Thr	Met	Gly	Glu	Pro	Val	Gly	Ile	Pro	Leu	Ile	Val	Leu	Ile	
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Phe	Tyr	Lys	Asn	Gln	Ser	Arg	Lys	Tyr	Leu	Asn	Lys	Gly	Asn	Gly	Asn	
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Trp	Glu	Glu	Ser	Lys	Ala	Leu	Leu	Phe	Arg	Glu	Glu	Leu	Asp	Tyr	Leu	
385					390					395					400	
Asp	Ser	Ile	Phe	Asn	Asp	Phe	Val	Thr	Val	Asn	Leu	Ser	Arg	Arg	Ser	
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Asp	Tyr	Tyr	Arg	Asn	Gly	Thr	Gly	Thr	Ser	Glu	Ile	Glu	Gln	Thr	Leu	
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Asp	Met	Asn	Val	Tyr	Val	Glu	Pro	Asp	Thr	Pro	Cys	Ala	Gly	Trp	Thr	
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Thr	Tyr	Ile	His	Lys	Leu	Glu	Glu	Gly	Gly	Glu	Gly	Gly	Ile	Glu	Lys	
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Pro Phe Gln Ile Arg Gln Leu Trp Phe Ser Lys Gln Lys Phe Asp Ile
465 470 475 480

Phe Pro Met Gly Lys Val Ser Ile Val Asn Val Tyr Gly Lys Asn Asp
485 490 495

Glu Pro Leu Ser Tyr Ala Pro Ser Ile Phe Ser Val Ile Arg Glu Asp
500 505 510

Gly Ile Gln Ile Phe Tyr Val Arg Ala Tyr Ser Gln Tyr Leu Leu Asp
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Ser Ser Val Asn Pro Gln Asn Leu Pro Gln Lys Leu Asn Thr Leu
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<212> PRT

<213> Theileria parva

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Gln Ala Ile Val Asp Cys Val Lys Thr Thr Leu Gly Pro Arg Gly Met
35 40 45

Asp Lys Leu Ile His Thr Glu Arg Asp Val Thr Ile Thr Asn Asp Gly
50 55 60

Ala Thr Val Leu Lys Leu Leu Asp Ile Thr His Pro Ala Ala Ser Val
65 70 75 80

Leu Val Asp Ile Ala Lys Ser Gln Asp Asp Glu Val Gly Asp Gly Thr
85 90 95

Thr Ser Val Thr Val Leu Ala Gly Glu Leu Leu Asn Glu Ala Lys Ala
100 105 110

Phe Ile Leu Asp Gly Ile Ser Pro Gln Val Ile Ile Lys Tyr Tyr Arg
115 120 125

Glu Ala Cys Gln Val Ala Leu Asn Leu Ile Asp Lys Val Ala Ile His
130 135 140

Leu Ser Asn Lys Ser Ser Thr Asp Lys Lys Glu Leu Leu Ile Lys Cys
145 150 155 160

Ala Glu Thr Thr Phe Asn Ser Lys Leu Leu Ser Gly Tyr Lys Thr Phe
165 170 175

Phe Ala Lys Met Val Val Glu Ala Val Ala Thr Leu Asp Glu Asp Leu
180 185 190

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Asp Glu Asp Met Ile Gly Val Lys Lys Val Thr Gly Gly Ser Cys Glu
 195 200 205
 Asp Ser Leu Leu Val Lys Gly Val Ala Phe Lys Lys Thr Phe Ser Tyr
 210 215 220
 Ala Gly Ala Glu Gln Gln Pro Lys Lys Phe Val Asn Pro Lys Ile Leu
 225 230 235 240
 Leu Leu Asn Leu Glu Leu Glu Leu Lys Ser Glu Lys Glu Asn Ala Glu
 245 250 255
 Ile Val Ile Asn Asn Pro Gln Glu Tyr Gln Lys Ile Ile Asp Ala Glu
 260 265 270
 Tyr Arg Ile Ile Phe Glu Lys Leu Glu Asn Ala Val Lys Leu Gly Ala
 275 280 285
 Asn Val Val Leu Ser Lys Leu Pro Ile Gly Asp Leu Ala Thr Gln Tyr
 290 295 300
 Phe Ala Asp Lys Asn Val Phe Cys Ala Gly Arg Val Asp Glu Asn Asp
 305 310 315 320
 Leu Ile Arg Thr Ser Lys Ala Thr Gly Ala Ser Ile Gln Thr Thr Leu
 325 330 335
 Asn Asn Leu Ser Val Asp Val Leu Gly Thr Cys Gly Val Phe Glu Glu
 340 345 350
 Val Gln Ile Gly Ser Glu Arg Tyr Asn Met Phe Thr Asp Cys Lys Ser
 355 360 365
 Ala Lys Thr Cys Thr Ile Val Leu Arg Gly Gly Gly Gln Gln Phe Ile
 370 375 380
 Asp Glu Ser Glu Arg Ser Leu His Asp Ala Ile Met Ile Val Arg Arg
 385 390 395 400
 Ala Thr Lys Cys Asn Thr Ile Leu Pro Gly Ala Gly Ala Ile Glu Met
 405 410 415
 Leu Leu Ser Thr Tyr Leu Leu His Tyr Ser Leu Asn Thr Ile Asn Pro
 420 425 430
 Thr Asp Ser Val Asn His Val Asn Cys Val Asn Ser Val Asn His Val
 435 440 445
 Asn Gly Val Thr Gly Val Asn Lys Ser Leu Val Gly Lys Arg His Ile
 450 455 460
 Ile Met Asn Gly Phe Ala Lys Ala Leu Glu Cys Ile Pro Arg Asn Leu
 465 470 475 480
 Ala Thr Asn Ser Gly Tyr Asn Ser Asn Asp Leu Leu Ser Ile Leu Arg
 485 490 495

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Asn Lys Tyr Asn Gln Leu Glu Ile Val Asn Gly Glu Ile Lys Val Asn
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 Asn Glu Glu Ser Trp Tyr Gly Ile Asp Cys Tyr Lys Gly Ser Val Cys
 515 520 525
 Asn Ala Tyr Lys Ala Cys Ile Trp Glu Pro Ser Leu Val Lys Lys Asn
 530 535 540
 Ser Ile Tyr Ser Ala Thr Glu Ala Ala Cys Leu Val Leu Ser Val Asp
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Gln Pro Lys

<210> 3
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 <213> Theileria parva

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 35 40 45
 Ala Tyr Cys Phe Asp Gly Thr Lys Arg Leu Cys His Ile Arg Gly Lys
 50 55 60
 Met Arg Lys Arg Val Trp Val Asn Ala Gly Asp Ile Ile Leu Val Ser
 65 70 75 80
 Leu Arg Asp Phe Gln Asp Ser Lys Ala Asp Val Ile Ala Lys Tyr Thr
 85 90 95
 Ala Glu Glu Ala Arg Thr Leu Lys Ala Tyr Gly Glu Leu Pro Glu Ala
 100 105 110
 Thr Lys Ile Asn Glu Thr Asp Val Tyr Asp Asp Glu Ala Asp Asn Cys
 115 120 125
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 Gln Glu Glu Ser Asp Phe Asp Ile Asp Asp Leu
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<213> Theileria parva

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Asn Lys Glu Ile Phe Leu Arg Glu Leu Ile Ser Asn Ala Ser Asp Ala
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Leu Glu Lys Ile Arg Tyr Glu Ala Ile Lys Asp Pro Lys Gln Ile Glu
 50           55           60

Asp Gln Pro Asp Tyr Tyr Ile Arg Leu Tyr Ala Asp Lys Asn Asn Asn
 65           70           75           80

Thr Leu Thr Ile Glu Asp Ser Gly Ile Gly Met Thr Lys Ala Asp Leu
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Val Asn Asn Leu Gly Thr Ile Ala Lys Ser Gly Thr Arg Ala Phe Met
      100          105          110

Glu Ala Leu Gln Ala Gly Ser Asp Met Ser Met Ile Gly Gln Phe Gly
 115           120           125

Val Gly Phe Tyr Ser Ala Tyr Leu Val Ala Asp Lys Val Thr Val Val
 130           135          140

Ser Lys Asn Asn Ala Asp Asp Gln Tyr Val Trp Glu Ser Thr Ala Ser
 145           150          155          160

Gly His Phe Thr Val Lys Lys Asp Asp Ser His Glu Pro Leu Lys Arg
      165          170          175

Gly Thr Arg Leu Ile Leu His Leu Lys Glu Asp Gln Thr Glu Tyr Leu
      180          185          190

Glu Glu Arg Arg Leu Lys Glu Leu Val Lys Lys His Ser Glu Phe Ile
      195          200          205

Ser Phe Pro Ile Ser Leu Ser Val Glu Lys Thr Gln Glu Thr Glu Val
 210           215          220

Thr Asp Asp Glu Ala Glu Leu Asp Glu Asp Lys Lys Pro Glu Glu Glu
 225           230          235          240

Lys Pro Lys Asp Asp Lys Val Glu Asp Val Thr Asp Glu Lys Val Thr
      245          250          255

Asp Val Thr Asp Glu Glu Glu Lys Lys Glu Glu Lys Lys Lys Lys Lys
 260           265          270

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Arg Lys Val Thr Asn Val Thr Arg Glu Trp Glu Met Leu Asn Lys Gln
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 Lys Pro Ile Trp Met Arg Leu Pro Ser Glu Val Thr Asn Glu Glu Tyr
 290 295 300
 Ala Ala Phe Tyr Lys Asn Leu Thr Asn Asp Trp Glu Asp His Leu Ala
 305 310 315 320
 Val Lys His Phe Ser Val Glu Gly Gln Leu Glu Phe Lys Ala Leu Leu
 325 330 335
 Phe Val Pro Arg Arg Ala Pro Phe Asp Met Phe Glu Ser Arg Lys Lys
 340 345 350
 Lys Asn Asn Ile Lys Leu Tyr Val Arg Arg Val Phe Ile Met Asp Asp
 355 360 365
 Cys Glu Glu Leu Ile Pro Glu Trp Leu Ser Phe Val Lys Gly Val Val
 370 375 380
 Asp Ser Glu Asp Leu Pro Leu Asn Ile Ser Arg Glu Thr Leu Gln Gln
 385 390 395 400
 Asn Lys Ile Leu Lys Val Ile Arg Lys Asn Leu Val Lys Lys Cys Leu
 405 410 415
 Glu Leu Phe Asn Glu Leu Thr Glu Lys Lys Glu Asp Phe Lys Lys Phe
 420 425 430
 Tyr Glu Gln Phe Ser Lys Asn Leu Lys Leu Gly Ile His Glu Asp Asn
 435 440 445
 Ala Asn Arg Ser Lys Ile Ala Glu Leu Leu Arg Phe Glu Thr Thr Lys
 450 455 460
 Ser Gly Asp Glu Leu Val Ser Leu Lys Glu Tyr Val Asp Arg Met Lys
 465 470 475 480
 Ser Asp Gln Lys Tyr Val Tyr Tyr Ile Thr Gly Glu Ser Lys Gln Ser
 485 490 495
 Val Ala Ser Ser Pro Phe Leu Glu Thr Leu Arg Ala Arg Asp Tyr Glu
 500 505 510
 Val Leu Tyr Met Thr Asp Pro Ile Asp Glu Tyr Ala Val Gln Gln Ile
 515 520 525
 Lys Glu Phe Glu Gly Lys Lys Leu Lys Cys Cys Thr Lys Glu Gly Leu
 530 535 540
 Asp Leu Asp Glu Gly Glu Asp Glu Lys Lys Ser Phe Glu Ala Leu Lys
 545 550 555 560
 Glu Glu Met Glu Pro Leu Cys Lys His Ile Lys Glu Val Leu His Asp
 565 570 575

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Lys Val Glu Lys Val Val Cys Gly Thr Arg Phe Thr Asp Ser Pro Cys
 580 585 590
 Ala Leu Val Thr Ser Glu Phe Gly Trp Ser Ala Asn Met Glu Arg Ile
 595 600 605
 Met Lys Ala Gln Ala Leu Arg Asp Ser Ser Ile Thr Ser Tyr Met Leu
 610 615 620
 Ser Lys Lys Ile Met Glu Ile Asn Pro Arg His Ser Ile Met Lys Glu
 625 630 635 640
 Leu Lys Thr Arg Ala Ala Asn Asp Lys Thr Asp Lys Thr Val Lys Asp
 645 650 655
 Leu Val Trp Leu Leu Tyr Asp Thr Ala Leu Leu Thr Ser Gly Phe Asn
 660 665 670
 Leu Asp Glu Pro Thr Gln Phe Gly Asn Arg Ile Tyr Arg Met Ile Lys
 675 680 685
 Leu Gly Leu Ser Leu Asp Asp Glu Glu His Val Glu Glu Asp Ser Ser
 690 695 700
 Met Pro Pro Leu Asp Glu Pro Val Val Asp Ser Lys Met Glu Glu Val
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<210> 5
 <211> 440
 <212> PRT
 <213> Theileria parva

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 Asn Val Lys Val Asp Ala Leu Glu Arg Val Asp Thr Glu Ser Val Leu
 35 40 45
 Asn Tyr Asp Thr Val Leu Glu Lys Lys Pro Leu Arg Ser Ser Val Ala
 50 55 60
 Ser Phe Phe Lys Arg Tyr Ser Ala Val Leu Val Ile Leu Thr Ala Val
 65 70 75 80
 Leu Leu Phe Thr Phe Thr Phe Ala Ala Ile Ala Leu Ser Ser Gly Arg
 85 90 95
 Ser Ala Ile Arg Lys Asn Arg Glu Leu Leu Ser Val Glu Phe Glu Lys
 100 105 110

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Leu Gln Phe Asp Asn Phe Val Thr Ile Lys Gly Glu Arg Glu Glu Asp
 115 120 125
 Phe Pro Lys Met Val Ala Glu Val Leu Tyr Lys Val Ala Val Glu Phe
 130 135 140
 Asp Pro Lys Glu Glu Ala Leu Ile Tyr Val Gln Phe Asn Asp Phe Asn
 145 150 155 160
 Lys Gln His Asp Lys Lys His Asn Asn Tyr Arg His Lys Lys Thr Ser
 165 170 175
 Tyr Thr Asn Phe Arg Asn Asn Leu Asn Asp Ile Asn Glu His Asn Ala
 180 185 190
 Lys Pro Asn Leu Ser Tyr Thr Lys Asn Met Asn His Phe Gly Asp Ile
 195 200 205
 Ser Ser Lys Asp Phe Met Lys Arg Tyr Thr Lys Lys Val Leu Leu Asn
 210 215 220
 Leu Pro Lys Asp His Val Ser Thr Tyr Asn Asn Asn Arg Pro Met Ser
 225 230 235 240
 Val Asp Leu Arg Ser His Gly Val Leu Thr Pro Val Lys Cys Gln Glu
 245 250 255
 Glu Asn Glu Leu Ser Trp Pro Tyr Ser Val Val Ala Val Ala Glu Ser
 260 265 270
 Phe Val Lys Lys Thr Ser Gln Lys Thr Val Ser Leu Ser Glu Lys Gln
 275 280 285
 Leu Val Asp Cys Val Thr Asp Lys Lys Ser Ala Asn Asn Pro Phe Leu
 290 295 300
 Gly Tyr Lys Tyr Leu Lys Asp Leu Gly Leu Phe Glu Ser Glu Leu Val
 305 310 315 320
 Asp Lys Ser Thr Thr Lys Cys Pro Ala Leu Glu Gly Glu Arg Phe Lys
 325 330 335
 Val Pro Ser Tyr Ser Tyr Ser Tyr Glu Pro Asp Leu Val Ala Leu Leu
 340 345 350
 Leu Asn Ala Gly Pro Leu Thr Val Pro Val Ala Val Ser Glu Asp Trp
 355 360 365
 Gln Phe Tyr Ala Asp Gly Thr Leu Asp Val Cys Gly Ala Glu Leu Asn
 370 375 380
 His Phe Leu Thr Leu Val Gly Val Ser Phe Asp Glu Lys Gly Asn His
 385 390 395 400
 Trp Ile Leu Lys Asn Ser Phe Gly Glu Gly Trp Gly Asn Lys Gly Tyr
 405 410 415

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Leu Leu Leu Thr Arg Asn Ser Lys Glu Tyr Lys Asp Asp Cys Gly Leu
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Thr Ser Phe Ala Val Tyr Ala Val
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<210> 6

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<213> Theileria parva

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Glu Lys Glu Glu Glu Leu Lys Pro Pro Ser Ala Leu Glu Asp Glu Leu
 35 40 45

Lys Lys Arg Glu Glu Glu Ser Arg Lys Arg Met Glu Glu Met Gln Lys
 50 55 60

Glu Ile Leu Glu Lys Lys Leu Arg Glu Gly Lys Lys Ala Leu Glu Glu
 65 70 75 80

Leu Glu Lys Arg Glu Lys Glu Val Val Asp Glu Phe Ala Lys His Leu
 85 90 95

Lys Lys Pro Glu Glu Arg Leu Pro Lys Ile Ile Leu Thr Leu Asp Ser
 100 105 110

Gly Phe Pro Thr Val Asp Pro Ile Thr Tyr Thr Ser Gly Val Tyr Met
 115 120 125

Val Ala Val Ser Lys Thr Thr Phe Thr Ser Asp Ser Asp Leu Val Asp
 130 135 140

Phe Thr His Thr Leu Leu Gly Ile Lys Phe Leu Val Thr Gly Val Gln
 145 150 155 160

Phe Gly Gly Lys Thr Tyr Thr Ile Lys Pro Ile Glu Ala Thr Met Ala
 165 170 175

Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe Leu Leu
 180 185 190

Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp Gly Asp
 195 200 205

Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu Met Leu
 210 215 220

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Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu Ile Pro
 225 230 235 240
 Ala Pro Pro Gly Val Lys Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr
 245 250 255
 Ile Thr Pro Ser Val Pro Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser
 260 265 270
 Ala Pro Pro Thr Thr Pro Pro Thr Gly Leu Asn Phe Asn Leu Thr Val
 275 280 285
 Gln Asn Lys Phe Met Ile Gly Ser Gln Glu Val Lys Leu Asn Ile Thr
 290 295 300
 His Glu Tyr Glu Gly Val Tyr Glu Ala His Lys Tyr Phe Ile Glu Arg
 305 310 315 320
 Gly Ser Phe Thr Pro Thr Ser Phe Ser Ile Gly Asp Leu Pro Gln Thr
 325 330 335
 Gly Leu Pro Val Asn Gln Thr Val Asp Thr Ile Val Val Tyr Phe His
 340 345 350
 Arg Val Thr Met Gly Glu Pro Val Gly Ile Pro Leu Ile Val Leu Ile
 355 360 365
 Phe Tyr Lys Asn Gln Ser Arg Lys Tyr Leu Asn Lys Gly Asn Gly Asn
 370 375 380
 Trp Glu Glu Ser Lys Ala Leu Leu Phe Arg Glu Glu Leu Asp Tyr Leu
 385 390 395 400
 Asp Ser Ile Phe Asn Asp Phe Val Thr Val Asn Leu Ser Arg Arg Ser
 405 410 415
 Asp Tyr Tyr Arg Asn Gly Thr Gly Thr Ser Glu Ile Glu Gln Thr Leu
 420 425 430
 Asp Met Asn Val Tyr Val Glu Pro Asp Thr Pro Cys Ala Gly Trp Thr
 435 440 445
 Thr Tyr Ile His Lys Leu Glu Gly Gly Glu Gly Gly Ile Glu Lys
 450 455 460
 Pro Phe Gln Ile Arg Gln Leu Trp Phe Ser Lys Gln Lys Phe Asp Ile
 465 470 475 480
 Phe Pro Met Gly Lys Val Ser Ile Val Asn Val Tyr Gly Lys Asn Asp
 485 490 495
 Glu Pro Leu Ser Tyr Ala Pro Ser Ile Phe Ser Val Ile Arg Glu Asp
 500 505 510
 Gly Ile Gln Ile Phe Tyr Val Arg Ala Tyr Ser Gln Tyr Leu Leu Asp
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Ser Ser Val Asn Pro Gln Asn Leu Pro Gln Lys Leu Asn Thr Leu
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 35 40 45

Lys Lys Arg Glu Glu Glu Ser Arg Lys Arg Met Glu Glu Met Gln Lys
 50 55 60

Glu Ile Leu Glu Lys Lys Leu Arg Glu Gly Lys Lys Ala Leu Glu Glu
 65 70 75 80

Leu Glu Lys Arg Glu Lys Glu Val Val Asp Glu Phe Ala Lys His Leu
 85 90 95

Lys Lys Pro Glu Glu Arg Leu Pro Lys Ile Ile Leu Thr Leu Asp Ser
 100 105 110

Gly Phe Pro Thr Val Asp Pro Ile Thr Tyr Thr Ser Gly Val Tyr Met
 115 120 125

Val Ala Val Ser Lys Thr Thr Phe Thr Ser Asp Ser Asp Leu Val Asp
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Phe Thr His Thr Leu Leu Gly Ile Lys Phe Leu Val Thr Gly Val Gln
 145 150 155 160

Phe Gly Gly Lys Thr Tyr Thr Ile Lys Pro Ile Glu Ala Thr Met Ala
 165 170 175

Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe Leu Leu
 180 185 190

Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp Gly Asp
 195 200 205

Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu Met Leu
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Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu Ile Pro
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Ala

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<213> Theileria parva

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Ser Lys Ala Asp Val Ile Ala Lys Tyr

1 5

<210> 16

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<210> 18

<211> 1807

<212> DNA

<213> Theileria parva

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<211> 1740

<212> DNA

<213> *Theileria parva*

<400> 19

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atgagtcatt taatgaacct accaatcctt gtattgaagg aaggcactga tacatcccaa 60
ggccaagctc aaatcattag taatatcaac gcctgtcaag ctattgtcga ttgtgttaaa 120
actactctag gtcctagagg aatggacaag ttgatacata cggagagaga tgtgacgata 180
accaatgacg gtgctactgt tttgaaatta ctgatatata ctcatcctgc cgcttctgtt 240
cttggtgata tcgctaaatc acaagatgat gaagtccgtg atgggactac ttccgttact 300
gttctagcag gtgagttatt gaatgaagct aaggcgttta tattggatgg gataagtcct 360
caggttatca taaaatacta tcgtgaagcc tgtcaagttg ctttaaatct cattgataaa 420
gttgccattc atctctccaa caaatcctca atgataaga aagaactact gataaaatgt 480
gctgaaacta cttttaattc aaagttattg tctggttata aaacctttt tgccaagatg 540
gttgtggagg cagtggctac tttggatgag gacttggatg aggatatgat tgggtgttaa 600
aaagtcactg gtgggttcctg tgaggactca ctctagtca aggggtgtagc attcaagaaa 660
actttcagct acgctggggc tgaacaacag ccaaagaaat tcgtcaatcc aaagatttta 720
ttacttaatt tgggaattgga actcaaatcc gaaaaagaaa acgcagaaat tgttatcaat 780
aatccacaag aatatcagaa gataatagat gccgagtata ggataaatatt tgagaagctt 840
gagaatgcag tgaaactcgg tgctaattgta gttttatcta aattgccaat tgggtgattta 900
gcaacacaat actttgcaga taaaaatgta ttttgtgccg gccgggttga tgaaaatgat 960
cttataagaa cgagtaaagc tactggtgct tctattcaaa ccactctcaa taacctttca 1020
gttgacgtct taggaacttg tgggtgtgtt gaggaagtgc aaattgggtc tgaacgttac 1080
aatatgttca cagattgcaa gagtgcaaaa accgtacaaa ttgtgttgag aggtggagggt 1140
cagcagttca ttgatgatac tgaacgttca ctccatgacg cgattatgat tgtcagaaga 1200
gcaactaaat gtaatactat ccttcccggg gctggtgcc a ttgagatgtt gctctcaact 1260
tatctctcc actattctct caacactatt aatcccacag actctgtcaa ccatgttaac 1320
tgcgttaact ccgtaaatca tggtaatgga gttactgggg tgaataagag tctggtgggt 1380
aagaggcaca taataatgaa cgggtttgca aaggcattgg agtgtattcc aaggaattta 1440

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gccactaatt ctgggtacaa ttcaaatgat ttattatcga tactaagaaa taaatacaat 1500
caattggaaa tagtcaatgg agagataaag gtgaataatg aggagagttg gtatggaata 1560
gattgttaca aggggaagtgt atgtaacgca tacaaggctt gtatttggga gccgagtttg 1620
gtgaaaaaaa actcaattta ctgagctact gaagcagctt gccttgttct ctcagttgat 1680
gaaactgtca aaaaccaatc cagacaacag ttacaaagcg cactaccaca acccaataa 1740

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<210> 20

<211> 468

<212> DNA

<213> *Theileria parva*

<400> 20

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atgccgaaaa ataaaggcaa aggaggaaag aaccggagac gcggtaaaaa tgacaatgaa 60
ggcgaaaaaa gagaattagt cttcaaaatg gaagatcaag aatatgctca agttttacgt 120
atgctcggtg atggcagact tgaagcctac tgttttgacg gcactaaacg tctttgccat 180
attagaggaa agatgaggaa gcgagtttgg gtaaatgccg gcgatattat tttggtatcg 240
cttagagatt tccaggacag caaggctgac gtgatcgcaa agtacactgc tgaggaggct 300
cgtactctga aggcttacgg cgagttgcct gaagcgacca aaatcaacga aactgacgtg 360
tacgacgacg aggccgacaa ctgcattgac ttccaggacg tatcgtctga atcagaacct 420
gaggatgagt cacaagagga gtcggatttc gatatcgatg atttataa 468

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<210> 21

<211> 2166

<212> DNA

<213> *Theileria parva*

<400> 21

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atgacatcaa aggacgagac acctgatcag gaggtctacg cttttaatgc tgatatctcc 60
cagcttttaa gcttgatcat caacgcattt tatagtaaca aggagatttt ccttcgtgaa 120
ctcattagca acgctagcga cgactggaa aaaattaggt atgaggcaat caaggatcca 180
aagcaaatcg aggatcaacc cgattactat atcaggctgt atgccgacaa gaacaacaa 240
acctcacaa tcgaagattc cggatttggc atgaccaaag ccgacctcgt gaacaacctc 300
ggtacaattg ccaaatccgg cacaagagca ttcatggagg cactgcaagc aggcctcggac 360
atgtcaatga tcggacagtt tgggtgtcgg ttctactcag catacctggt cgcagataag 420
gtgacagtag tgtccaagaa caacgcagac gaccagtagc tctgggagtc aacagcctca 480
ggccacttta cagtgaagaa ggacgactcg cagcagccgc tcaaaagagg aactagacta 540
atactgcat tgaaggagga ccaaactgag taccttgagg agagaaggct gaaagagctt 600
gttaagaagc acagcgagtt catttcattc ccaatctcgc tctcagtaga gaagaccag 660
gagaccgagg tcaactgacga cgaggcagag ctagacgagg acaagaagcc cgaggaggag 720
aagcccaagg acgataaggt ggaggacggt actgacgaga aagtgaccga cgtcactgac 780
gaggaggaga aaaaggagga aaagaaaaag aagaagagga aggtcaccaa cgtaacgcgt 840
gagtgggaaa tgcttaacaa gcagaagcca atttggatga gactcccgtc tgaagtcacc 900
aacgaagaat atgcagcgtt ctacaagaac ttaaccaacg attggaaga ccacttggcc 960
gtgaaacact tcagcgttga gggtcagctt gagttcaaag ctctactgtt cgtcccaaga 1020
agagcgccgt ttgacatggt cgagtcccgc aaaaagaaaa acaacatcaa gttgtacgtc 1080
agacgcgtat ttatcatgga cgactgtgag gagctcatcc cggagtggct ttcctttgtg 1140
aagggtgtgg tagactcaga ggacctgccc ttgaatatatt ctagggaaac tctccagcag 1200
aacaagatcc tcaaggatcat caggaagaac ttggtgaaaa agtgcctcga gctcttcaat 1260
gaactcatg agaagaagga ggacttcaag aagtctctac agcagttcag caagaacctg 1320
aagctgggaa tccacgagga caacgctaag cgctcaaaga tcgccgaact gttgagggtc 1380
gagacaacca agagcggaga cgaactcgtg tcaactcaagg agtacgttga caggatgaag 1440
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cctttccttg agacctgag ggctcgcgac tacgaagtcc tgtacatgac tgaccaatt 1560
gatgagtagc cagttcagca gatcaaggag tttgaaggca agaaactcaa gtgctgtacc 1620
aaggagggcc tggaccttga tgaggcgag gatgaaaga agtcctttga agcgtcagg 1680

```


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gaagaaatgg aacctctttg caagcacatc aaggaagtgc tccacgacaa ggtggaaaag 1740
gtcgtgtgtg gaacaaggtt taccgactct ccattgcgcac ttgtcaccag cgagttcggc 1800
tggagcgcga acatggagcg tatcatgaaa gcacaagctc tcagagactc gtccataaca 1860
agctacatgc tgagcaagaa gatcatggag attaacccga gacatagcat catgaaggag 1920
ctcaaaacta gagctgcaaa cgacaaaaca gataaaaccg tcaaggacct agtctggctt 1980
ctctacgaca cagcgctctt aacctcaggg tttaacctcg atgagcccac ccagtttgga 2040
aacaggatct acaggatgat caagctcggg ctctcattgg acgacgagga acacgtagaa 2100
gaggactcat caatgccgcc gctggatgag cccgttgtcg actccaaaat ggaggaagtt 2160
gactaa
2166

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<210> 22

<211> 1323

<212> DNA

<213> *Theileria parva*

<400> 22

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atgcttggaa atcatgtcat gggatctaata tccccccaca ttaaaatttt atcatctgtt 60
acattcttac atattgctaa aatggaagaa gtagaaaacg taaaagtcca cgccttggag 120
cgtgttgaca ctgagtctgt ccttaattat gacactgtgt tagaaaagaa accattgcgc 180
agcagtgttg cctctttctt caaaagatac agtgctgttc tcgtaattat aactgccgtg 240
ctattattca cattcacttt tgcagcaata gcattgtcat caggcagaag cgcaatcaga 300
aagaacagag aactcctgtc agtcgaattt gaaaagcttc agttcgataa tttcgtgaca 360
attaaggagg aaagggaaga ggacttcccc aagatggtag ctgaagttct ttacaagggt 420
gcagtgcagt ttgacccaaa agaagaggcc ttgatctacg tccagttcaa tgacttcaac 480
aagcaacacg acaagaagca caacaattac aggcacaaga agacctcgta caccaacttc 540
agaaacaacc ttaatgatat aaacgagcac aacgcaaaac caaacctgtc gtacaccaag 600
aacatgaacc acttcggtga catatcatcc aaggatttca tgaagagata caccaagaaa 660
gtactcttga acttgccaaa agaccacgtg tccacctata acaacaacag accaatgtca 720
gttgatctca gaagccatgg tgtattgact ccagtcaagt gccaagaaga aaatgaactc 780
tcattggccat actccgtagt agcagtcgcc gagtcattcg ttaagaagac atcacaaaag 840
accgtatccc tcagcgaaaa acaattagta gattgcgtta cagataagaa atctgcaaac 900
aaccattctt tgggttacia ataccttaag gacttgggtc tggtcgaatc agaactcgta 960
gacaaatcca caaccaagtg cccagcattg gaagggtgaa gattcaaagt cccatcatac 1020
tcatactcat atgagccaga tttgggtggc ctcttggtga atgcaggacc actcactgta 1080
ccagttgcag tgagcgagga ttggcaattc tacgctgatg gaaccttgga tgtatgcggg 1140
gctgaattga accacttctt gaccctagta ggtgtcagct ttgacgaaaa aggcaatcac 1200
tgataactca aaaactcatt cgggtgaaggc tggggaaaca agggatacct actggtgact 1260
cgcaatagca aggaatacaa agatgattgt ggattgacct ccttcgcagt gtacgcagtt 1320
taa
1323

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<210> 23

<211> 33

<212> DNA

<213> *Theileria parva*

<400> 23

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gtagggatc caaagggttaa agaagaaatg cta

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33

<210> 24

<211> 33

<212> DNA

<213> *Theileria parva*

<400> 24
agtcacgaag aactaaaaaa attgggaatg cta 33

<210> 25
<211> 33
<212> DNA
<213> Theileria parva

<400> 25
aaatcatcac atggtatggg aaaggtagga aaa 33

<210> 26
<211> 27
<212> DNA
<213> Theileria parva

<400> 26
tttgacacaa gcctagtgtg cgtatta 27

<210> 27
<211> 27
<212> DNA
<213> Theileria parva

<400> 27
caaagcctag tgtgcgtatt aatgaaa 27

<210> 28
<211> 27
<212> DNA
<213> Theileria parva

<400> 28
actggtgctt ctattcaaac cactctc 27

<210> 29
<211> 27
<212> DNA
<213> Theileria parva

<400> 29
agcaaggctg acgtgatcgc aaagtac 27

<210> 30
<211> 27
<212> DNA
<213> Theileria parva

<400> 30
agcaaggctg acgtgatcgc aaagtac 27

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<210> 31
<211> 27
<212> DNA
<213> Theileria parva

<400> 31
tgcggtgctg aattgaacca cttcttg

27

<210> 32
<211> 16
<212> PRT
<213> Theileria parva

<400> 32
Phe Leu Val Gly Tyr Pro Lys Val Lys Glu Glu Met Leu Glu Met Ala
1 5 10 15

<210> 33
<211> 27
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic
Primer

<400> 33
ggatccccgg aaaaagaaga ggaactc

27

<210> 34
<211> 24
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic
Primer

<400> 34
aatgtagttt tatctaaatt gccca

24

<210> 35
<211> 33
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic
Primer

<400> 35
ggatccgaaa tggcgaaaaa taaaggcaaa gga

33

<210> 36
<211> 30
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic
Primer

<400> 36
gccagaatt cgatgacatc aaaggacgag 30

<210> 37
<211> 28
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic
Primer

<400> 37
ctgcagttaa tttttgaggt aaattttg 28

<210> 38
<211> 25
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic
Primer

<400> 38
gaggagataa gttgagagca acatc 25

<210> 39
<211> 31
<212> DNA
<213> Artificial Sequence

<220>
<223> Description of Artificial Sequence: Synthetic
Primer

<400> 39
ctgcagttat aaatcatcga tatcgaaatc t 31

<210> 40
<211> 30
<212> DNA

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<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic
Primer

<400> 40

ggcgcggccg cgtcaacttc ctccattttg

30

<210> 41

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic
Primer

<400> 41

atggccactt caattgcatt tgcc

24

<210> 42

<211> 24

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: Synthetic
Primer

<400> 42

ttaaataaaa tatttatgag cttc

24

<210> 43

<211> 157

<212> PRT

<213> Theileria parva

<400> 43

Met Arg Val Lys Lys Val Leu Leu Tyr Thr Leu Pro Val Val Gly Ile
1 5 10 15Leu Leu Ala Gly Ser Leu Ile Ile Phe Asn Phe Val Arg Lys Arg Pro
20 25 30Glu Lys Glu Glu Glu Leu Lys Pro Pro Ser Ala Leu Glu Asp Glu Leu
35 40 45Lys Lys Arg Glu Glu Glu Ser Arg Lys Arg Met Glu Glu Met Gln Lys
50 55 60Glu Ile Leu Glu Lys Lys Leu Arg Glu Gly Lys Lys Ala Leu Glu Glu
65 70 75 80

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Leu Glu Lys Arg Glu Lys Glu Val Val Asp Glu Phe Ala Lys His Leu
85 90 95
Lys Lys Pro Glu Glu Arg Leu Pro Lys Ile Ile Asp Ser Gly Phe Pro
100 105 110
Thr Val Asp Pro Ile Thr Tyr Thr Ser Gly Val Tyr Met Val Ala Val
115 120 125
Ser Lys Thr Thr Phe Thr Ser Asp Ser Asp Leu Val Asp Phe Thr His
130 135 140
Thr Leu Leu Gly Ile Lys Phe Leu Val Thr Gly Val Gln
145 150 155

<210> 44
<211> 107
<212> PRT
<213> Theileria parva

<400> 44
Met Arg Val Lys Lys Val Leu Leu Tyr Thr Leu Pro Val Val Gly Ile
1 5 10 15
Leu Leu Ala Gly Ser Leu Ile Ile Phe Asn Phe Val Arg Lys Arg Pro
20 25 30
Glu Lys Glu Glu Glu Leu Lys Pro Pro Ser Ala Leu Glu Asp Glu Leu
35 40 45
Lys Lys Arg Glu Glu Glu Ser Arg Lys Arg Met Glu Glu Met Gln Lys
50 55 60
Glu Ile Leu Glu Lys Lys Leu Arg Glu Gly Lys Lys Ala Leu Glu Glu
65 70 75 80
Leu Glu Lys Arg Glu Lys Glu Val Val Asp Glu Phe Ala Lys His Leu
85 90 95
Lys Lys Pro Glu Glu Arg Leu Pro Lys Ile Ile
100 105

<210> 45
<211> 103
<212> PRT
<213> Theileria parva

<400> 45
Met Arg Val Lys Lys Val Leu Leu Tyr Thr Leu Pro Val Val Gly Ile
1 5 10 15
Leu Leu Ala Gly Ser Leu Ile Ile Phe Asn Phe Val Arg Lys Arg Pro
20 25 30

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Glu Lys Glu Glu Glu Leu Lys Pro Pro Ser Ala Leu Glu Asp Glu Leu
 35 40 45
 Lys Lys Arg Glu Glu Glu Ser Arg Lys Arg Met Glu Glu Met Gln Lys
 50 55 60
 Glu Ile Leu Glu Lys Lys Leu Arg Glu Gly Lys Lys Ala Leu Glu Glu
 65 70 75 80
 Leu Glu Lys Arg Glu Lys Glu Val Val Asp Glu Phe Ala Lys His Leu
 85 90 95
 Lys Lys Pro Glu Glu Arg Leu
 100

<210> 46
 <211> 37
 <212> PRT
 <213> Theileria parva

<400> 46
 Met Arg Val Lys Lys Val Leu Leu Tyr Thr Leu Pro Val Val Gly Ile
 1 5 10 15
 Leu Leu Ala Gly Ser Leu Ile Ile Phe Asn Phe Val Arg Lys Arg Pro
 20 25 30
 Glu Lys Glu Glu Glu
 35

<210> 47
 <211> 66
 <212> PRT
 <213> Theileria parva

<400> 47
 Met Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp Gly Asp
 1 5 10 15
 Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu Met Leu
 20 25 30
 Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu Ile Pro
 35 40 45
 Ala Pro Pro Gly Val Lys Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr
 50 55 60
 Ile Thr
 65

<210> 48
 <211> 68
 <212> PRT

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<213> Theileria parva

<400> 48

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Met Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro Pro Thr Ile Pro
 1             5             10             15

Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro Pro Thr Gly Leu
          20             25             30

Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Ile Gly Ser Gln Glu
          35             40             45

Val Lys Leu Asn Ile Thr His Glu Tyr Glu Gly Val Tyr Glu Ala His
          50             55             60

Lys Tyr Phe Ile
          65

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<210> 49

<211> 62

<212> PRT

<213> Theileria parva

<400> 49

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Met Gly Val Tyr Glu Ala His Lys Tyr Phe Ile Glu Arg Gly Ser Phe
 1             5             10             15

Thr Pro Thr Ser Phe Ser Ile Gly Asp Leu Pro Gln Thr Gly Leu Pro
          20             25             30

Val Asn Gln Thr Val Asp Thr Ile Val Val Tyr Phe His Arg Val Thr
          35             40             45

Met Gly Glu Pro Val Gly Ile Pro Leu Ile Val Leu Ile Phe
          50             55             60

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<210> 50

<211> 148

<212> PRT

<213> Theileria parva

<400> 50

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Met Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp Gly Asp
 1             5             10             15

Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu Met Leu
          20             25             30

Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu Ile Pro
          35             40             45

Ala Pro Pro Gly Val Lys Pro Glu Ala Pro Thr Pro Thr Thr Ile Thr
          50             55             60

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Pro Ser Val Pro Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro
 65 70 75 80

Pro Thr Thr Pro Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn
 85 90 95

Lys Phe Lys Phe Met Ile Gly Ser Gln Glu Val Lys Leu Asn Ile Thr
 100 105 110

His Glu Tyr Glu Gly Val Tyr Glu Ala His Lys Tyr Phe Ile Glu Arg
 115 120 125

Gly Ser Phe Thr Pro Thr Ser Phe Ser Ile Gly Asp Leu Pro Gln Thr
 130 135 140

Gly Leu Pro Val
 145

<210> 51
 <211> 121
 <212> PRT
 <213> Theileria parva

<400> 51
 Met Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro Pro Thr Ile Pro
 1 5 10 15

Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro Pro Thr Gly Leu
 20 25 30

Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Lys Phe Met Ile Gly Ser
 35 40 45

Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Glu Gly Val Tyr Glu
 50 55 60

Ala His Lys Tyr Phe Ile Glu Arg Gly Ser Phe Thr Pro Thr Ser Phe
 65 70 75 80

Ser Ile Gly Asp Leu Pro Gln Thr Gly Leu Pro Val Asn Gln Thr Val
 85 90 95

Asp Thr Ile Val Val Tyr Phe His Arg Val Thr Met Gly Glu Pro Val
 100 105 110

Gly Ile Pro Leu Ile Val Leu Ile Phe
 115 120

<210> 52
 <211> 177
 <212> PRT
 <213> Theileria parva

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<400> 52

Met Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp Gly Asp
 1 5 10 15
 Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu Met Leu
 20 25 30
 Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu Ile Pro
 35 40 45
 Ala Pro Pro Gly Val Lys Pro Glu Ala Pro Thr Pro Thr Thr Ile Thr
 50 55 60
 Pro Ser Val Pro Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro
 65 70 75 80
 Pro Thr Thr Pro Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn
 85 90 95
 Lys Phe Lys Phe Met Ile Gly Ser Gln Glu Val Lys Leu Asn Ile Thr
 100 105 110
 His Glu Tyr Glu Gly Val Tyr Glu Ala His Lys Tyr Phe Ile Glu Arg
 115 120 125
 Gly Ser Phe Thr Pro Thr Ser Phe Ser Ile Gly Asp Leu Pro Gln Thr
 130 135 140
 Gly Leu Pro Val Asn Gln Thr Val Asp Thr Ile Val Val Tyr Phe His
 145 150 155 160
 Arg Val Thr Met Gly Glu Pro Val Gly Ile Pro Leu Ile Val Leu Ile
 165 170 175
 Phe

<210> 53

<211> 543

<212> PRT

<213> Theileria parva

<400> 53

Met Arg Val Lys Lys Val Leu Leu Tyr Thr Leu Pro Val Val Gly Ile
 1 5 10 15
 Leu Leu Ala Gly Ser Leu Ile Ile Phe Asn Phe Val Arg Lys Arg Pro
 20 25 30
 Glu Lys Glu Glu Glu Leu Lys Pro Pro Ser Ala Leu Glu Asp Glu Leu
 35 40 45
 Lys Lys Arg Glu Glu Glu Ser Arg Lys Arg Met Glu Glu Met Gln Lys
 50 55 60

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Glu Ile Leu Glu Lys Lys Leu Arg Glu Gly Lys Lys Ala Leu Glu Glu
 65 70 75 80
 Leu Glu Lys Cys Glu Lys Glu Met Val Asp Glu Phe Glu Lys His Leu
 85 90 95
 Lys Lys Pro Glu Glu Arg Leu Pro Lys Ile Ile Leu Ile Leu Asp Ser
 100 105 110
 Gly Phe Pro Thr Val Asp Pro Ile Thr Tyr Thr Ser Gly Val Tyr Met
 115 120 125
 Val Ala Val Ser Lys Thr Thr Phe Thr Ser Asp Ser Asp Leu Val Asp
 130 135 140
 Phe Thr His Thr Leu Leu Gly Ile Lys Phe Leu Val Ala Gly Val Gln
 145 150 155 160
 Phe Gly Gly Lys Thr Tyr Thr Ile Lys Pro Ile Glu Ala Thr Met Ala
 165 170 175
 Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe Leu Leu
 180 185 190
 Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp Gly Asp
 195 200 205
 Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu Ile Ile
 210 215 220
 Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu Ile Pro
 225 230 235 240
 Ala Pro Pro Gly Val Lys Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr
 245 250 255
 Ile Thr Pro Ser Val Pro Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser
 260 265 270
 Ala Pro Pro Thr Thr Pro Pro Thr Gly Leu Asn Phe Asn Leu Thr Val
 275 280 285
 Gln Asn Lys Phe Met Val Gly Ser Gln Glu Val Lys Leu Asn Ile Thr
 290 295 300
 His Glu Tyr Asp Gly Val Tyr Glu Ala His Lys Tyr Phe Ile Glu Lys
 305 310 315 320
 Gly Arg Phe Thr Pro Thr Ser Phe Ser Ile Gly Ala Asp Pro Gln Thr
 325 330 335
 Gly Leu Pro Val Asn Gln Thr Val Asp Thr Ile Val Val Tyr Phe His
 340 345 350
 Arg Val Thr Met Gly Glu Pro Val Gly Ile Pro Leu Ile Val Leu Val
 355 360 365

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Phe Tyr Lys Asn Gln Ser Thr Lys Tyr Leu Asn Lys Gly Asn Gly Asn
 370 375 380

Trp Glu Glu Ser Lys Ala Leu Leu Phe Arg Glu Glu Leu Asp Phe Leu
 385 390 395 400

Asp Ser Met Phe Asn Gly Tyr Val Thr Val Asn Leu Ser Arg Arg Ser
 405 410 415

Asp Tyr Tyr Arg Asn Gly Thr Gly Thr Ser Glu Ile Glu Lys Thr Leu
 420 425 430

Asp Met Asn Val Tyr Val Glu Pro Asp Thr Pro Cys Leu Gly Trp Thr
 435 440 445

Thr Tyr Ile His Lys Leu Glu Glu Gly Gly Glu Gly Gly Ile Glu Lys
 450 455 460

Pro Phe Gln Ile Arg Gln Leu Trp Phe Ser Lys Gln Lys Phe Asp Ile
 465 470 475 480

Phe Pro Met Gly Lys Val Ser Ile Val Asn Val Tyr Gly Lys Asn Asp
 485 490 495

Glu Pro Leu Ser Tyr Ala Pro Ser Ile Phe Ser Val Ile Arg Glu Asp
 500 505 510

Gly Ile Gln Ile Phe Tyr Val Arg Ala Tyr Ser Gln Tyr Leu Leu Asp
 515 520 525

Ser Ser Val Asn Pro Gln Asn Leu Pro Gln Lys Leu Thr Ala Glu
 530 535 540

<210> 54

<211> 72

<212> PRT

<213> Theileria parva

<400> 54

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe
 1 5 10 15

Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp
 20 25 30

Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu
 35 40 45

Met Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu
 50 55 60

Ile Pro Ala Pro Pro Gly Val Lys
 65 70

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<210> 55
<211> 72
<212> PRT
<213> Theileria parva

<400> 55
Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe
1 5 10 15
Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp
20 25 30
Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu
35 40 45
Met Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu
50 55 60
Ile Pro Ala Pro Pro Gly Val Lys
65 70

<210> 56
<211> 72
<212> PRT
<213> Theileria parva

<400> 56
Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe
1 5 10 15
Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp
20 25 30
Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu
35 40 45
Met Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu
50 55 60
Ile Pro Ala Pro Pro Gly Val Lys
65 70

<210> 57
<211> 72
<212> PRT
<213> Theileria parva

<400> 57
Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe
1 5 10 15
Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp
20 25 30

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Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu
35 40 45

Met Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu
50 55 60

Ile Pro Ala Pro Pro Gly Val Lys
65 70

<210> 58
<211> 72
<212> PRT
<213> Theileria parva

<400> 58
Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe
1 5 10 15

Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp
20 25 30

Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu
35 40 45

Met Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu
50 55 60

Ile Pro Ala Pro Pro Gly Val Lys
65 70

<210> 59
<211> 72
<212> PRT
<213> Theileria parva

<400> 59
Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe
1 5 10 15

Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Leu Lys Asn Asp
20 25 30

Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu
35 40 45

Met Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu
50 55 60

Ile Pro Ala Pro Pro Gly Val Lys
65 70

<210> 60
<211> 72
<212> PRT

31/37

<213> Theileria parva

<400> 60

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe
1 5 10 15

Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp
20 25 30

Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu
35 40 45

Ile Ile Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu
50 55 60

Ile Pro Ala Pro Pro Gly Val Lys
65 70

<210> 61

<211> 70

<212> PRT

<213> Theileria parva

<400> 61

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Ile Cys Tyr Phe
1 5 10 15

Leu Leu Ile Pro Ala Pro Lys Pro Ile Phe Phe Lys Asn Asp Gly Asp
20 25 30

Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu Ile Ile
35 40 45

Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu Ile Pro
50 55 60

Ala Pro Pro Gly Val Lys
65 70

<210> 62

<211> 72

<212> PRT

<213> Theileria parva

<400> 62

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe
1 5 10 15

Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp
20 25 30

Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu
35 40 45

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Ile Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu
50 55 60

Ile Pro Ala Pro Pro Gly Val Lys
65 70

<210> 63

<211> 72

<212> PRT

<213> Theileria parva

<400> 63

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe
1 5 10 15

Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp
20 25 30

Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu
35 40 45

Ile Leu Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu
50 55 60

Ile Pro Ala Pro Pro Gly Val Lys
65 70

<210> 64

<211> 72

<212> PRT

<213> Theileria parva

<400> 64

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe
1 5 10 15

Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp
20 25 30

Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu
35 40 45

Ile Ile Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu
50 55 60

Ile Pro Ala Pro Pro Gly Val Lys
65 70

<210> 65

<211> 72

<212> PRT

<213> Theileria parva

33/37

<400> 65

Met Ala Thr Ser Ile Ala Phe Ala Ala Asp Pro Gly Phe Cys Tyr Phe
 1 5 10 15
 Leu Leu Ile Pro Gly Pro Asp Ser Lys Pro Ile Phe Phe Lys Asn Asp
 20 25 30
 Gly Asp Lys Phe Leu Arg Cys Val Gly Tyr Pro Lys Val Lys Glu Glu
 35 40 45
 Ile Ile Glu Met Ala Thr Lys Phe Asn Arg Leu Pro Lys Gly Val Glu
 50 55 60
 Ile Pro Ala Pro Pro Gly Val Lys
 65 70

<210> 66

<211> 72

<212> PRT

<213> Theileria parva

<400> 66

Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro
 1 5 10 15
 Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro
 20 25 30
 Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Ile
 35 40 45
 Gly Ser Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Glu Gly Val
 50 55 60
 Tyr Glu Ala His Lys Tyr Phe Ile
 65 70

<210> 67

<211> 72

<212> PRT

<213> Theileria parva

<400> 67

Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro
 1 5 10 15
 Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro
 20 25 30
 Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Ile
 35 40 45
 Gly Ser Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Glu Gly Val
 50 55 60

34/37

Tyr Glu Ala His Lys Tyr Phe Ile
65 70

<210> 68

<211> 72

<212> PRT

<213> Theileria parva

<400> 68

Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro
1 5 10 15

Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro
20 25 30

Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Ile
35 40 45

Gly Ser Gln Glu Val Asn Leu Asn Ile Thr His Glu Tyr Glu Gly Val
50 55 60

Tyr Glu Ala His Lys Tyr Phe Ile
65 70

<210> 69

<211> 72

<212> PRT

<213> Theileria parva

<400> 69

Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro
1 5 10 15

Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro
20 25 30

Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Ile
35 40 45

Gly Ser Gln Glu Val Asn Leu Asn Ile Thr His Glu Tyr Glu Gly Val
50 55 60

Tyr Glu Ala His Lys Tyr Phe Ile
65 70

<210> 70

<211> 72

<212> PRT

<213> Theileria parva

<400> 70

Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro
1 5 10 15

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Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro
 20 25 30

Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Ile
 35 40 45

Gly Ser Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Glu Gly Val
 50 55 60

Tyr Glu Ala His Lys Tyr Phe Ile
 65 70

<210> 71
 <211> 64
 <212> PRT
 <213> Theileria parva

<400> 71
 Pro Glu Ala Pro Thr Pro Thr Pro Thr Pro Ile Thr Pro Ser Ala Pro
 1 5 10 15

Pro Thr Thr Pro Pro Thr Thr Pro Pro Lys Gly Leu Asn Phe Asn Leu
 20 25 30

Thr Leu Gln Asn Lys Phe Met Ile Gly Ser Gln Glu Val Lys Leu Ser
 35 40 45

Ile Thr His Glu Tyr Asp Gly Val Tyr Glu Ala His Lys Tyr Phe Ile
 50 55 60

<210> 72
 <211> 72
 <212> PRT
 <213> Theileria parva

<400> 72
 Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro
 1 5 10 15

Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro
 20 25 30

Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Val
 35 40 45

Gly Ser Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Asp Gly Val
 50 55 60

Tyr Glu Ala His Lys Tyr Phe Ile
 65 70

36/37

<210> 73
<211> 72
<212> PRT
<213> Theileria parva

<400> 73
Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro
1 5 10 15
Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro
20 25 30
Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Val
35 40 45
Gly Ser Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Asp Gly Val
50 55 60
Tyr Glu Ala His Lys Tyr Phe Ile
65 70

<210> 74
<211> 72
<212> PRT
<213> Theileria parva

<400> 74
Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro
1 5 10 15
Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro
20 25 30
Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Val
35 40 45
Gly Ser Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Glu Gly Val
50 55 60
Tyr Glu Ala His Lys Tyr Phe Ile
65 70

<210> 75
<211> 72
<212> PRT
<213> Theileria parva

<400> 75
Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro
1 5 10 15
Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro
20 25 30

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Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Ile
35 40 45

Gly Ser Pro Glu Val Lys Leu Asn Ile Thr His Glu Tyr Glu Gly Val
50 55 60

Tyr Glu Ala His Lys Tyr Phe Ile
65 70

<210> 76

<211> 72

<212> PRT

<213> Theileria parva

<400> 76

Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro
1 5 10 15

Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro
20 25 30

Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Val
35 40 45

Gly Ser Gln Glu Val Lys Leu Asn Ile Pro His Glu Tyr Asp Gly Val
50 55 60

Tyr Glu Ala His Lys Tyr Phe Ile
65 70

<210> 77

<211> 72

<212> PRT

<213> Theileria parva

<400> 77

Pro Glu Ala Pro Thr Pro Thr Pro Thr Thr Ile Thr Pro Ser Val Pro
1 5 10 15

Pro Thr Ile Pro Thr Pro Ile Thr Pro Ser Ala Pro Pro Thr Thr Pro
20 25 30

Pro Thr Gly Leu Asn Phe Asn Leu Thr Val Gln Asn Lys Phe Met Val
35 40 45

Gly Ser Gln Glu Val Lys Leu Asn Ile Thr His Glu Tyr Asp Gly Val
50 55 60

Tyr Glu Ala His Lys Tyr Phe Ile
65 70